

REFLECTIONS
UPON THE
Theory of the Earth,

OCCASION'D BY A

Late EXAMINATION of it.

In a Letter to a Friend.

L O N D O N,

Printed for *Walter Kettilby*, at the *Bishop's-Head* in *S. Paul's Church-Yard*, 1699.

REFLECTIONS

UPON THE

THEORY OF THE EARTH

BY A

ERRATA

PAGE 11. Line 7. r. *antediluvian*. P. 42. l. 25, and 26.
r. *Ellipsis*. Ibid. l. 29. r. *Isosceles*.

Printed for Walter Heath at the Bishop's
Head in St. Paul's Church-Yard, 1833.

S I R,

I Receiv'd the honour of your Letter, with the Book you was pleas'd to send me, containing an Examination of *The Theory of the Earth*. And according as you desire, I shall give you my thoughts of it in as narrow a compass as I can. The Author of the *Theory*, you know, hath set down in Three Propositions the Foundation of the Whole Work, and so long as those Propositions stand firm, the substance of the *Theory* is safe, whatsoever becomes of particular modes of explication in some parts: which are as Problems, and may be explained several ways without prejudice to the Principles upon which the *Theory* stands.

The Theorist takes but one single Postulatum, viz. That the *Earth rise from a Chaos*. This is not call'd into question, and this being granted, He lays down Three Propositions consecutively. First, *That the Primitive or Ante-diluvian Earth was of a different form and construction from the present Earth*. Secondly, *That the face of that Earth as it rise from a Chaos, was smooth, regular and uniform: without Mountains or Rocks, and without an open Sea*. Thirdly, *That the disruption of the Abyss, or dissolution of that Primeval Earth, and its fall into the Abyss, was the cause of the Universal Deluge, and of the destruction of the Old World*: As also of the irregular form of the present Earth.

These are the Three Fundamental Propositions laid down in the Fourth, Fifth and Sixth Chapters of the

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Theory.

Theory. And for a further proof and confirmation of them, especially of the last, another Proposition is added (*chap. 7.*) in these words, *The present form and structure of the Earth, both as to the surface, and as to the interior parts of it, so far as they are accessible and known to us, do exactly answer to the foregoing Theory concerning the form and dissolution of the First Earth, and is not so justly explained by any other Hypothesis yet known.* This is offer'd as a proof *a posteriori*, as they call it, or from the effects: to show the consent and agreement of the parts and construction of the present Earth, to that Supposition of its being a sort of Ruine, or the effect and remains of a disruption or dissolution. And to make this good, The Theorist draws a short Scheme of the general Form of the present Earth, and its irregularity: Then shows more particularly the marks or signatures of a ruine or disruption in several parts of it: as in Mountains and Rocks, in the great Chanel of the Sea, and in Subterraneous Cavities, and other broken and disfigur'd parts of the Earth.

These conclusions with their arguments are the Summ and principal Contents of the First Book; But I must also mind you of a Corollary in the Second Book, drawn from these primary Propositions, which concerns the situation of the Primitive Earth. For the Theorist supposes that the posture of that Earth, or of its Axis was not oblique to the Axis of the Sun or of the Ecliptick, as it is now, but lay parallel with the Axis of the Sun, and perpendicular to the Plane of the Ecliptick. By reason of which Position there was a perpetual Spring or perpetual Equinox in that Primitive Earth. This, though a consequence only from the first Propositions, I thought fit to mind you of, as being one of the peculiar and distinguishing Characters of this *Theory*. This

This being the state of the *Theory*, or of those parts of it that support the rest, and wherein its strength consists, he that will attack it to purpose, must throw down, in the first place, these leading Propositions. If the Examiner had taken this method, and confuted the proofs that are brought in confirmation of each of them, he needed have done no more. For the Foundation being destroyed, the Superstructure would fall of its own accord. But, if instead of this, you only pick out a loose stone here or there; or strike off a Pinnacle, this will not weaken the Foundation, nor have any considerable effect upon the whole Building. Let us therefore consider in the first place, what this Examiner hath said against these Fundamental Propositions, and accordingly you will better judge of the rest of his Work.

His first Chapter is to show that the Deluge might be made by a Miracle. But who ever deny'd that? No doubt God by his Omnipotency may do whatsoever he pleases to the utmost extent of possibilities. But he does not tell us wherein this Miracle consisted. Doth he suppose that the Deluge could be made without any increase of Waters upon the Earth? If there was an increase of Waters, either they were created a-new, or brought thither from some other part of the Universe: So far is plain. And if he supposes a New Creation of Waters for this purpose, and an annihilation of them again at the end of the Flood, it had been fair to have answered the Arguments that are given against that Hypothesis in the 3^d Chapter of the *Theory*. *Engl.* And seeing there is no mention made of any such thing in the Sacred History, if he assert it, he must bring some proof of his assertion; for we are not upon such terms as to trust upon bare word. On the

other hand, if he proceed upon such Waters as were already in being, and for his purpose either bring down supercelestial Water, or bring up subterraneous, he mu't tell us what those Waters are, and must answer such objections as are brought against either sort in the Second and Third Chapters of the *Theory*. We must have some fixt point, some mark to aim at, if the case be argued. Upon the whole, I think this his First Chapter might have been spar'd, as either affirming nothing particularly, or giving no proof of what is affirm'd.

In his next Chapter about the *Chaos*, I was in hopes to have found some thing more considerable, but (besides his long *excerpta* out of the *Theory*, both here and elsewhere, which make a good part of his Book) I find nothing but two small Objections against the formation of the First Earth, as it is describ'd by the Theorist. This Examiner says, That the little earthy particles of the *Chaos* would not swim upon the surface of Oil, or any such unctuous liquor: for how little soever, yet being earthy, and Earth being heavier than Oil, they must descend thorough it. But he grants that dust will swim upon Oil, and I willingly allow, if these descending parts were *huge lumps of solid matter*, such as we shall meet with in his next Chapter, they would easily break through both the Oil and the Water under it: but that little tenuious particles or small dust should float upon Oil, I think is no wonder. And he is so kind as to note an instance of this himself, and to subjoin his reasons for it. We see dust, saith he, though specifically heavier than Oil, yet not to sink when cast upon it. And the reason is, because all terrestrial Bodies, tho fluid in their kind, yet in some degree resist separation, and consequently, I add, viscous

viscous liquors which have some sort of entanglement amongst themselves, resist separation more than others. Then he remarks further, that according as Bodies are less, they have more surface in proportion to their bulk, and consequently, that *small Bodies, whose weight or force to separate the parts of the Fluid is but very little, may have a surface so large, that they cannot overcome the resistance of the Fluid. That is, they cannot make way for their descent through the Fluid, and therefore must swim upon the surface of it.* Be it so, then the particles here mentioned by the Theorist, being little and of large surfaces in proportion to their bulk, would swim upon the surface of the Fluid, or mix with it, which is all the Theorist affirms or supposes. And as this tender film grew into a crust, and that into a solid Arch, the parts of it would mutually support one another: the concave superficies of the Orb overspreading and leaning upon the Waters. And this also shews that his instance of a Solid Globe sinking in a Fluid, is little to the purpose in this case.

But he hath a second Objection behind, or another P. 40. consideration to prove that those little particles would pierce and pass through this oily Liquid. * This consideration is, the great height of the place from which they descended: whereby, he thinks, they would acquire such a celerity and force in their descent, that they must needs break through this orb of oily liquors when they came at it. But this is to suppose that they descended without interruption, or without having their course stopt and their force broken in several parts of their journey. This is an arbitrary and groundless supposition. For these floating particles did not fall like a stone, or a ponderous body, in one continued line, but rather like fleaks of Snow, hovering

hovering and playing in the Air: their course being often interrupted and diverted, and their force broken again and again before they came to the end of their journey; so that this suggestion can be of no force or effect in the present case. However, if that will gratifie him, we can allow that thousands and millions of these little particles might slip or creep thorough this clammy liquor, yet there would enow of them be entangled there to make it, first, a gross liquid, then a sort of concretion, so as to stop the succeeding particles from passing thorough it.

I have done with all that is argumentative in this Chapter. But this Writer is pleased to go sometimes out of his way of Philosophizing, to make reflections of another kind. Accordingly here and elsewhere he makes insinuations and suggestions as if the Theorist did not own the hand of Providence, or of a particular and extraordinary Providence in the formation of the Earth. Or as if all things in the great revolutions of the Natural World were carried on solely by material and mechanical Causes. This suggestion ought to be taken notice of, as being contrary to the sense of the Theorist as it is exprest in several places. In speaking of the motions of the Chaos, the Theorist

P. 11. Note, the pages are cited according to the 3d. Edit. of the Engl. and the 1d. of the Lat. Theor.

Engl. Theor. ch. 8. p. 71, &c.

makes *the steady hand of Providence which keeps all things in weight and measure, to be the invisible guide of all its motions.* And in concluding his discourse about the formation of the Earth (*chap. 5. p. 45.*) The Theorist says, *This structure is so marvellous, that it ought rather to be consider'd as a particular effect of the Divine Art, than as the work of Nature:* with many other remarks there to the same purpose. Then as to the Dissolution of the Earth and the conduct of the Deluge, 'tis made miraculous also by the Theorist. And upon that occasion

casion an account is given of Providence, both ordinary and extraordinary, in reference to the government of Nature. And that not only as to the Formation and Dissolution of the Earth, but also as to its Conflagration and Renovation. For the Theorist always puts those great revolutions under the particular conduct and moderation of Providence. Lastly, As to the whole Universe, He is far from making that the product either of *Chance* or *Necessity*, or of any purely material or mechanical Causes. As you may see at large in the Two last Chapters of the *Theory*. So that what this Author hath said (rudely enough, according to his way) of Mr. Wotton, That *he either understands no Geometry, or else that he never read D. C. his Principles*, may with a little change be apply'd to himself in this case, That either he never read over, or does not remember, or, which is still worse, does wilfully misrepresent what the Theorist hath writ upon this subject. The sum of all is this, *Deus non deficit in necessariis, nec redundat in superfluis*. God is the God of Nature, and the Laws of Nature are his Laws: These we are to follow so far as they will go, and where they fall short we must rise to higher Principles; but we ought not to introduce a needless exercise of the divine Power, for a cover to our ignorance.

To conclude this Chapter, I will leave one Advertisement with the Examiner concerning the Chaos. When he speaks of the World's rising from the Mosaick Chaos, if by *World* he understand the whole Universe, as he seems to do: not this inferiour World only, but the fixt Stars also, and all the Heavens: If that, I say, be his meaning and opinion, he will meet with other opponents besides the Theorist, that will contest that point with him.

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We come now to the Third Chapter, concerning the *Mountains* of the Earth, which is a subject indeed that deserves consideration, seeing it reaches to the three fundamental Propositions before mentioned, and the Form of the Antediluvian Earth. Which Form the Examiner would have to be the same with that of the present Earth: To have had Mountains and Rocks, an open chanel of the Sea, with all the cavities and irregularities within or without the surface of it, as at present. If he can prove this, he needs go no farther, he may spare his pains for the rest. I'll undertake that the Theorist shall make no farther defence of his Theory, if the Examiner can make good proof of this one conclusion. But on the other hand, the Examiner ought to be so ingenuous as to acknowledge that all that he hath said besides, till this be prov'd, can be of little or no effect as to the substance of the Theory. Let us then consider how he raises Mountains and Rocks, and gives us an account of all the other inequalities that we find in the present form of the Earth, by an immediate formation or deduction from the Chaos.

To shew this, he supposes that the Chaos had Mountains and Rocks swimming in it, or according to his expression, *huge lumps of solid matter*. These are things, I confess, which I never heard of before in a Chaos: which hath been always describ'd and suppos'd a mass of fluid matter all over: But this Author confidently says, *We must conclude THEREFORE that the Chaos was not so fluid a mass, &c.* This therefore refers us to an antecedent reason, which is this, He says, to make the Chaos an entirely fluid mass is hard to be granted, *since the greatest parts of Bodies we have in the Earth, at least so far as we can discern, are hard and solid,*
and

P. 49. 51.

P. 48.

Ibid.

and there is not such a quantity of water in the Earth, as would be requisite to soften and liquifie them all. Besides a great part of them, as Stones and Metals, are incapable of being liquified by water. Very good, What is this to the Theory? Does the Theorist any where affirm or suppose that there were Stones or Metals in the Chaos? or that they were liquified by water? This must refer to some Hypothesis of his own, or to some other Author's Hypothesis that run in his mind. The Theorist owns no such doctrine or supposition.

However let's consider how this new Idea of a Chaos is consistent with the Laws of Nature. What made these *huge lumps of solid matter*, whether Stone or Metal, to swim in the fluid mass? This is against all rules of Gravity and of Staticks: as he seems to acknowledge, and urge it when he thought it to his purpose. In the precedent Chapter (p. 42.) when he speaks of Stones and Minerals, he says, *'Tis certain that these great heavy Bodies must have sunk to the bottom if they were left to themselves.* And he that will not allow dust or little earthy particles to float upon an Oily Liquor, I wonder how he will make, not little particles, but these huge solid lumps, of Stone, Metals or Minerals, to float in the Chaos.

He seems to own and be sensible of this inconvenience (p. 50.) and thereupon finds an expedient or evasion which a lesser Wit would not have thought on. He supposes that these *huge firm solid Lumps* were hollow, like empty bottles, and that would keep them from sinking. But who told him they were hollow? Is not this precarious? or if one would use such terms as he does, is not this *Chimerical and ridiculous*? What made those solid firm Lumps hollow? When, or where, or how were their inward parts scrap'd out of them?

them? Nor would this hollowneſs, however they came by it, make them ſwim, unleſs there was a meer Vacuum in each of them. If they were filled with the liquid matter of the Chaos, they would indeed be lighter than if wholly ſolid, but they would ſtill be heavier than an equal bulk of the fluid Chaos, and conſequently would ſink in it: the preponderancy that would ariſe from the ſhell or ſolid part ſtill remaining.

Now let's conſider how ſuch Mountains or long ridges of Mountains as we have upon the Earth, were formed and ſetled by theſe floating Lumps. He ſays, *P. 50, 51. part of theſe lumps or maſſes ſtanding out or being higher than the Fluid, would compoſe a Mountain:* as there are *Mountains of Ice that float upon the Northern Seas.* But are not mountains of Rock and Stone, ſuch as ours commonly are, heavier than mountains of Ice, that is ſpecifically lighter than Water? This might have been conſider'd by the Examiner in drawing the parallel. And ſtill I'm at a loſs, what *Fluid* it is he means, when he ſays, *Theſe Lumps or Maſſes ſtanding out, or being higher than the Fluid:* Does he mean by this Fluid the whole Chaos? Did theſe Mountains ſtand at the top of the Chaos, partly within and partly above it? Then what drew them down below, if they ſtood equally pois'd there in their Fluid, and as high as the Moon, if the Chaos reacht ſo high. This one would think could not be his meaning 'tis ſo extravagant: and yet there was no other Fluid than the general Chaos, till that was divided and diſtinguiſht into ſeveral Maſſes. Then indeed there was an Abyſs, or a region of Waters that covered the interiour Earth, and was ſeparate from the Air above. Let us then ſuppoſe this Abyſs to be the waters or Fluid this Author means, upon which his Mountains ſtood: then the reſt of the

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the Earth, as it came to be form'd, must be continu'd and joyn'd with these Mountains, and in like manner laid over the waters: so as in this method you see we should have an Orb of Earth built over the Abyfs. This is a very favourable stroke for the Theorist, and grants him in effect his principal conclusion, viz. That the *first anteluvian Earth* ~~was~~ *built over the Abyfs*. This being admitted, there could be no universal Deluge without a disruption of that Earth, and an eruption of the Abyfs: which is a main point gain'd. And 'tis plain we make no false Logick in collecting this from his Principles and Concessions: For, as we said before, if these Mountains were founded upon the Abyfs, they must have a continuity and conjunction with the rest of the surface of the Earth, if they were such as our Mountains are now, and so all the habitable Earth must be spread upon the Abyfs.

But still he hath another difficulty to encounter, How the great Chanel of the Sea was made upon this supposition. Why was not that part of the Globe fill'd up by the descent of the earthy particles of the Chaos as well as the rest? The Chanel of the Ocean is commonly suppos'd to take up half of the Globe, how came this gaping Gulph to remain unfill'd, seeing it was encompass'd with the Chaos as well as any other parts? Was the motion of the particles suspended from descending upon that part of the Globe: or were they fill'd up at first; and afterwards thrown out again to make room for the Sea? This may deserve his consideration, as well as the Mountains. And how dextrous soever this Author may be in other things I know not, but, in my mind, he hath no good hand in making Mountains: and I'm afraid he would have no better success in forming the Chanel

of the Sea, which he is wisely pleas'd to take no notice of.

P. 52. And indeed the Examiner seems to be sensible himself that he hath no good luck in assigning the *Efficient Causes* of Mountains from the Chaos, and therefore he is willing to bear off from that point, and to lay the whole stress upon their *Final Causes*: without any regard to their origin or how they came first into being. His words are these, *But supposing the Efficient Causes of Mountains unknown or impossible to be assign'd, yet still there remains the final causes to be enquir'd into, which will do as well for our purpose*, with what follows there concerning those Authors that exclude final causes. If there be such Authors, let them answer for themselves, the Theorist is not concern'd. Grant the first point, That Mountains could not arise from any known Efficient Causes in the first concretion of the Chaos, or in the first habitable Earth that rise from it, the Theorist readily allows (as appears fully in the two last Chapters of the Second Book) the use of final causes in the contemplation of Nature, as being great arguments of the Wisdom and Goodness of God. But this ought not to exclude the Efficient Causes in a *Theory*, otherwise it would be no *Theory*, but a work of another Nature. Though a man knew the Final Cause of a Watch or Clock, namely, to tell him the Hour of the Day, yet if he did not know the construction of its parts, what was the Spring of motion, what the order of the Wheels, and how they mov'd the Hand of the Dial, he could not be said to understand that little Machine; or at least not to understand it so well as he that knew the construction and dependance of all its parts, in vertue whereof that effect was brought to pass. In many cases we do not understand the Final

Eng. Theor.

Final Causes, and in many we do not understand the Efficient, but notwithstanding we must endeavour, so far as we are able, to joyn and understand them both: the end and the means to it. For by the one as well as the other, the divine Power and Wisdom are illustrated. And seeing every effect hath its Efficient Cause, if we cannot reach it we must acknowledge our Speculations to be so far imperfect.

After this excursion about Final Causes, he concludes, *That it is impossible to subsist or live without Rocks and Mountains.* Consequently, no Earth is habitable without Rocks and Mountains. But how can he tell this? Hath he been all over the Universe to make his Observations? or hath he had a Revelation to tell him that there is no one habitable Planet throughout all the Works of God but what is of the same Form with our Earth as to Rocks and Mountains. Who hath ever observ'd Mountains and Rocks in *Jupiter*, or in the remains of *Saturn*? I should think such a general assertion as he makes, a bold and unwarrantable limitation of the Divine Omniscience and Omnipotency. Who dares conclude that the infinite Wisdom and Power of God is confin'd to one single mode or fabrick of an habitable World? We know there are many Planets about our Sun besides this Earth, and of different positions and constructions: Neither do we know but there be as many about other Suns or fixt Stars: must we suppose that they are all cast in the same mould? That they are all formed after the Model of our Earth, with Mountains and Rocks, and Gulphs and Caverns?

*Urbem, quam dicunt Romam, Melibæe, putavi
Stalium ego, huic nostræ similem.*

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This was the judgment of the Shepherd: who could imagine nothing different or nothing better than his own Town or Village: those may imitate him that please. 'Tis true, *Suum cuique pulchrum*, is an usual saying, but we think that to proceed from fondness rather and self-conceit, than from a true and impartial judgment of things. In contemplating the Works of God we ought to have respect to his Almighty and infinite Wisdom, ἢ πολυποίκιλον σοφίαν, *multiformem sapientiam Dei*, rather than to the measures of our own experience and understanding. We may remember how an Heathen hath upbraided and derided that narrowness of Spirit, *Quæ tanta sunt animi angustia ut si Seryphi natus esses, nec unquam egressus ex Insulâ, in quâ Lepusculos, Vulpeculasque sæpe vidisses, non crederes Leones & Pantheras esse, cum tibi quales essent diceretur. Si verò de Elephanto quis diceret, etiam rideri te putares.* We may as well say that there can be no Animals of another form from those we have upon this Earth, as that there can be no Worlds, or habitable Earths of another form and structure from the present Earth. *An quicquam tam puerile dici potest,* says the same Author, *quàm si ea genera belluarum quæ in Rubro mari, Indiâve gignantur, nulla esse dicamus? Atqui ne curiosissimi quidem homines exquirendo audire tam multa possunt, quàm sunt multa quæ Terrâ, Mari, paludibus, fluminibus existunt, quæ negemus esse quia nunquam vidimus?* I mention such instances to shew that 'tis rashness or folly to confine the varieties of Providence and Nature to the narrow compass of what we have seen, or of what falls under our imagination. This is a more *strange and assuming boldness*, as he terms it, than what he ascribes to the Theorist for saying, We can observe no order in the situation of Mountains,

Cicer. de
Nat. Deor.
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P. 54.

tains, nor regularity in their form and shape. If the Examiner knows any, why does he not tell us what it is, and wherein it consists. Is it necessary that Mountains should be exact Pyramids or Cones, or any of the Regular Bodies? Or rang'd upon the Earth in rank and file, or in a quincuncial order, or like pretty garden-knots? If they had been design'd for beauty this might have done well: But providence seems on purpose to have left these irregularities in their Figure and Site, as marks and signatures to us that they are the effects of a ruine.

But to shew further and more particularly the necessity of Mountains, the Examiner says without them 'tis impossible there should be Rivers, or without Rivers an habitable world. Neither of these propositions seem to me to be sure: They run still upon impossibilities, which is a nice Topick and lies much out of our reach. I think Vapors may be condens'd other ways than by Mountains, and an Earth might be so fram'd as to give a course to Rivers tho there were no particular Mountains, if the general figure of it was higher in one part than another. Then as to the absolute necessity of Rivers to make an Earth habitable that is questionable too. We are told by good Authors of some Countries or Islands that have no rivers or springs, and yet are habitable and fruitful, being water'd by Dews. This may give us an advertisement, from a part to the whole, that an Earth may be made habitable without rivers. If at First vapours ascended and fell down in dews so as to *water the whole face of the Earth*, God might if he had pleas'd have continued the same course of Nature. And it is the opinion of many Interpreters, and seems to have been an ancient tradition, that there was no rain till the

P. 55.

and 61.

Gen. 2: 6.

Galil. Syst.
Cof. p. 133.
Hugen. Cof.
moib. l. 2.
p. 115.

the Deluge. If there was no Rain-bow in the first Earth (which I think the Theorist hath undeniably prov'd, Theor. Book II. c. 5.) it will be hard to prove that there were then any watery clouds in the habitable parts of the Earth. And our best Observators will allow no clouds or rains in the Moon (and some of them no Rivers) yet will not suppose the Moon uninhabitable. To conclude, 'tis a great vanity, to say no worse, for short-sighted Creatures and of narrow understandings to prescribe to Providence what is necessary and indispensable to the frame and order of an habitable World.

We proceed to his fourth Chapter : which is to shew the inconveniences that would fall upon the inhabitants of the Earth, in case it had such a posture as the Theorist hath assign'd to the Antediluvian Earth : namely, that its Axis was parallel to the Axis of the Ecliptick, or Perpendicular to its Plane, and not oblique as it stands now. But will this Author vouch that there are no habitable Planets in the Universe, or even about our Sun, that have this posture which he blames so much? *Jupiter* is known to have a perpetual Equinox, and his Axis parallel to the Axis of the Ecliptick : And *Mars* hath little or no obliquity that is observable. And must this be a reflection upon Providence? Or must we suppose that these Planets have no inhabitants, or that their habitations are very bad and incommodious? *Jupiter* is the noblest Planet we have in our Heaven, whether you consider its magnitude or the number of its Attendants. If then a Planet of that order and dignity have such a position and aspect to the Sun, why might not
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our Earth have had the same, proper to that state and agreeable to the Divine wisdom? Yet he is so bold as to say or suppose, That *this cannot well agree with the infinite Wisdom of its Maker*: as if he was able to make a measure or standard for all the Works of God. 'Tis a crude and injudicious thing from a few particulars, the rest unknown, to make an universal conclusion: which forward wits are apt to do. *προς ὀλίγα ἐπιβλεψάμενος*---*Ad pauca respiciens, facile pronuncias*, was Aristotle's observation of old, and it holds in all Ages. P. 66.

This Examiner censures the Theorist very rudely for making use of *Physical Causes*, and not arguing from *Final Causes*, which he says, *are the true Principles of Natural Philosophy*. But if this be the use he makes of Final Causes, To tell God Almighty what is best to be done, in this or that World: I had rather content my self with *Physical Causes* to know what God hath done, and conclude it to be the best, and that we should judge it so, if we had the same extent of thought and prospect its Maker had. There are indeed some *Final Causes* that are so manifest, that I should think it sottishness or obstinacy for a Man to deny them: but I should also think that Man presumptuous that should pretend to draw the Scheme and Plan of every World from his Idea of *Final Causes*. There are some men that mightily cry out against *Reason*, yet none more fond of it than they are when they can get it on their side. So some men inveigh against *Physical Causes* when others make use of them, and yet as gladly as any make use of them themselves when they can make them serve their purpose. And when they cannot reach them, then they despise them, and are all for *Final Causes*. This Author says, God P. 76.

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always

P. 63. always chuses such constitutions and positions of things, as bring with them the greatest good and utility to the Universe. Very true, to the Universe: But who made him judge what is best to the Universe? Does he look upon this Earth as the Universe? whereof it is but a small particle, or an atome in comparison. Must there be no variety in the numberless worlds which God hath made? Must they all be one and the same thing repeated again and again? That I'm sure does not well agree with the infinite Wisdom and Power of God.

But suppose we did confine our Thoughts to this Earth. We may be assur'd that it hath undergone and will undergo, within the compass of its duration, very different states, and yet all accommodate to Providence. Those that suppose the Heavens and the Earth never to have had any other constitution and construction than what they have now: or that there hath never been any great change and revolution in our Natural World, follow the very doctrine which S. Peter opposes and confutes in his 2d. Epistle: I mean the doctrine of those Scoffers, as he calls them, who said, *All things, the Heavens and the Earth, have remained in the same state they are in now, from the beginning, or from the Creation, and are to continue so.* In confutation of this opinion S. Peter reminds them of the Change made at the Deluge, and of the different constitution and construction of the Heavens and the Earth before and after the Deluge: whereby they were dispos'd to undergo a different fate, one by Water, and the other by Fire. And he tells us in the same place, that after the Conflagration there will be *New Heavens* and a *New Earth*. So that there is no one fixt and permanent state even of this Earth, according

cording to the Will and Wisdom of Providence. But enough hath been said by the Theorist upon this subject (*Theor. Lat. l. 1. c. 1. & 2. Review p. 160, &c. Archaeol. l. 2. c. 3, 5, 6.*) and if they will not consider the arguments propos'd there, 'twould be in vain to repeat them here.

These things premis'd, Let's consider what inconveniences are alledged, or what Arguments against that equality of Seasons, or the grand cause of them, the Parallelism of the Axis of the Earth with the Axis of the Sun. He says upon this supposition there is more heat now in the Climates of the Earth than could have been then. And what if there be? whether his computation (which is aim'd against another Author) be true or false, 'tis little to the *Theory*. If the heat was equal and moderate in the temperate and habitable Climates who would desire the extream heats of Summer? But he says, That heat would not be sufficient for the generation of Vegetables. How does that appear? supposing that heat constant throughout the whole Year. Does he think there are no Vegetables in *Jupiter*, which hath still the same position the Theorist gave to the Antediluvian Earth. And as to heat, that Planet is at vastly a greater distance from the Sun than our Earth, and consequently hath so much less heat: yet I cannot believe that great Planet to be only a huge lump of bald and barren Earth. As to our Antediluvian Earth, 'tis probable that the constitution of Plants and Animals was different then from what it is now, as their longevity was different, to which any excesses of heat or cold are noxious; and the frequency and multiplicity of generations and corruptions in the present Earth, is part of that vanity to which it was subjected. But this Ex-

P. 66.

aminer says moreover, If the first Earth had that position, the greatest part of it would not be habitable. But how much less habitable would it be than the present Earth? where the open Sea, which was not then, takes up half of its surface and makes it uninhabitable. 'Tis likely the Torrid Zone was uninhabitable in that Earth: but 'tis probable the Poles or Polar parts were more habitable than they are now, seeing they would have the Sun, or rather Half-Sun perpetually in their Horizon. And as to the temperate Climates, as we call them, they would be under such a gentle and constant warmth, as would be more grateful to the Inhabitants, and more proper and effectual for a continual Verdure and Vegetation, than any region of the present Earth is now.

But this Objector does not consider on the other hand, what an hard life they would lead in those days, at least in many parts of the Earth, if the seasons of the year were the same they are now, and they confin'd to Herbs, Fruits and Water: for that was the Diet of Mankind till the Deluge. Should we not think it an unmerciful imposition now, to be interdicted the use of Flesh-meat all the year long? Or rather is it possible that the life of Man could be supported by Herbs and Fruits and Water in the colder Climates, where the Winters are so long and barren, and the cold so vehement? But if you suppose a perpetual Spring throughout the Earth, the Heavens mild, and the juices of Fruits and Plants more nutritive, that Objection would cease, and their longevity be more intelligible.

We come now to the Causes of the change in the posture of the Earth, where the Theorist hath set down his conjectures what he thought the most probable to be

be the occasion of it: namely, either some inequality in the libration of the Earth, after it was dissolved and broken: or a change in the Magnetism of its Body, consequent upon its dissolution and the different situation of its parts. But this Examiner will neither allow any change to have been made in the position of the Earth since the beginning of the World: nor if there was a change, that it could be made from such Causes. The first of these points you see is matter of fact: and so it must be prov'd partly by History and partly by Reason. Some things are noted before, which argue that the Antediluvian Earth was different from the present in its frame and constitution, as also in reference to the Heavens: and the places are referred to where that matter is treated more largely by the Theorist. If it be granted that there was a permanent change made in the state of Nature at the Deluge, or any other time, but deny'd. that it was made by a change of the situation of the Earth and the consequences of it; then this Writer must assign some other change made which would have the same effects: that is, which will answer and agree with the Phenomena of the First Earth, and also of the present. When this is done, if it be clear and convictive, we must acquiesce in it. But I do not see that it is so much as attempted by this Author.

This suppos'd change, I say, is matter of Fact, and therefore we must consult History and Reason for the proof or disproof of it. As to History, the Theorist hath cited to this purpose *Leucippus*, *Anaxagoras*, *Democritus*, *Empedocles*, *Plato* and *Diogenes*. These were the most renowned Philosophers amongst the Ancients: and all these speak of an inclination of the Earth or the Poles, which hath been made in former ages. These,

These, one would think, might be allow'd as good witnesses of a former Tradition concerning a change in the situation of the Earth, when nothing is brought against them. And this change is particularly call'd by *Plato* ἀρμονία or ἀνωμαλία, a disharmony or disconcerting of the motions of the Heavens, which he makes the source and origin of the present Evils and inconveniences of Nature. Besides, he dates this change from the expiration of the reign of *Saturn*, or when *Jupiter* came to take the government upon him. And this, you know, in the style of those times, signifies the end of the Golden Age. Thus far *Plato* carries the Tradition. Now the Poets tell us expressly that there was a *perpetual Spring*, or a perpetual Equinox in the time of *Saturn*, and that the inequality of the Year, or the diversity of Seasons was first introduc'd by *Jupiter*. The Authors and places are well known and noted by the Theorist, I need not repeat them here. You see what this evidence amounts to, both that there hath been a change, and such a change, as alter'd the course of the Year and brought in a vicissitude of Seasons. And this according to the Doctrines or Traditions remaining amongst the Heathens. The *Jews* and Christians say the same thing but in another manner: They do not speak of the Golden Age, or of the reign of *Saturn* or *Jupiter*, but of the state of Paradise, or *Gan-Eden*; and concerning that they say the same things which the Heathen Authors say in different words. The *Jews* make a perpetual Equinox in Paradise, the Christians a perpetual serenity, a perpetual Spring; And this cannot be without a different situation of the Earth from what it hath now. He may see the citations, if he please, in the *Theory* or *Archæologia*.

It

It were to be wisht that this Examiner would look a little into Antiquity, when he hath time. It may be that would awaken him into new thoughts, and a more favourable opinion of the Theory as to this particular. Give me leave to mind him in his own way, what some ancient Astronomers have said relating to this subject. *Baptista Mantuanus* speaking of the longevity of the Antediluvians, says, *Erant illis, ut Astronomiâ & experimento constat, Cæli propitiores; volunt namque Astronomi, &c.* This he explains by an uniform and concentrical motion of the heavens and the Earth, at that time: To which he imputes the great vertue of their herbs and fruit, and the long lives of their Animals. *Petrus Aponensis*, who liv'd above an Age before *Mantuan*, gives us much what the same account: For making an answer to this question, *utrum natura humana sit debilitata ab eo quod antiquitus, necne*: He says, *Cum capita Zodiaci mobilis & immobilis ordinatè & directè concurrebant, tunc virtus perfectiori modo à primo principio per medias causas taliter ordinatas fortiori modo imprimebatur in ista inferiora, cum cause tunc sibi invicem corresponderent*—Propter quod concludendum est, tunc naturam humanam illo tempore, ut sic fortiozem & longæviozem extitisse. I give it in his own words as they are in his *Conciliator*. Differ. 9.

Georgius Pictorius, or an Author under his name, unto the same question about the longevity of the Antediluvians, gives a like answer from the same Astronomer, in these words, *Petrus Aponensis adfert rationem, & pro vario cursu & dispositione cælorum modò vitam humanam breviam, modò produci scribit. Ex Astronomiâ argumentum colligens, cum ait duos zodiacos, unum in nonâ spherâ, alterum in octavâ (quam Firma-*
mentum

De Patientia
 l. 2. c. 27.

Quest.
Phys. par.
 3. quest. 74.

mentum vocant) in initio rerum & temporum, sic à Deo fuisse dispositos, ut Aries Arieti, Taurus Tauro, Geminiis Gemini jungerentur: & amborum coeuntibus in unum viribus fortior in Terras fieret fluxus. Unde herbas tunc salubriores & fructus terra meliores, & longiores vitas animantium fuisse affirmat. Sed denuò illa syderali dissoluta ab invicem per motum societate, totum air inferiorem mundum agrotare, atque per decrementum claudicare cepisse. This you see is Astronomy in an old fashion'd dress, but you can easily take off the disguise, and apply it to the true Systeme of the Heavens. The same Author refers you for a more full explication of that matter to his *Lectiones successivæ Dial. prim.* which Book I have not yet had an opportunity to see. I believe it is in his *Opera Philologica*, printed in *Octavo at Basil.*

But since the first writing of the Theory, there have been Æthiopick Antiquities produc'd from an Abyssine Philosopher, and transmitted to us by *Francisco Patricio* in his Dialogues. If that account he gives of the Æthiopian *Archæologia* be true and genuine, they exceed all other upon this subject. For they do not only mention this particular of the unity of seasons in the Primitive Earth, but the other principal parts of the Theory: As the Concussion and Fraction of the Earth, that the face of it before was smooth and uniform, and upon that disruption it came into another form, with Mountains, Rocks, Sea and Islands. These and other such characters are mentioned there, whereof the Examiner may see an account, if he please, in the last edition of the *English Theory*. The story indeed is surprising which way soever you take it, whether it was the invention of that Abyssine Philosopher, or a real Tradition deriv'd from the Æthiopian

Æthiopian Gymnosophists. However that be, there are otherwise such conspicuous footsteps in Philosophick history, and in what may be call'd Ecclesiastick amongst the Jews and Christians, of some Revolution in the system of the world, as must give occasion to any thinking man to suppose that there hath been a change made in the situation of the Earth. This by some of the forementioned Authors is ascrib'd expressly to the Earth, and what by others (according to their hypothesis) is ascrib'd to the higher heavens, we know upon a just interpretation belongs to the Earth. Those also that ascribe such Phænomena to Paradise or the Golden Age, as are not intelligible upon any other supposition, must also be referr'd to this change of the site or posture of the Earth. So that upon all accounts (mediately or immediately) the matter of fact, That the Earth hath undergone such a change, is testified by History, Antiquity and Tradition. It deserves also to be observ'd that there was a general Tradition amongst the Ancients concerning the Inhabitability of the Torrid zone; which may be an argument or confirmation, that there was a state of Nature at one time or other, when this was true, and that such a general opinion could not arise and be continued so long without some foundation.

So much for History to determine matter of fact. Now as to Reason (which we mentioned as the other head to prove or disprove this conclusion) That form of the Primitive Earth which is assigned by the Theorist, being suppos'd, namely that it was regular, uniform, and had an equal libration, it would naturally take an even and parallel position with the Axis of its Orbit, or of the Ecliptick; as is set down more at large in the Theory. Nor can any reason be alledg'd to the contrary. Tis true, this Examiner not-
E withstanding

withstanding any Uniformity and Equilibration of that Earth, pretends it would be indifferent to any Position, or retain any Position given, as a Sphere will do put in a Fluid. This might be, if that Sphere or Globe was resting : but if it was turn'd about its Axis, and the Axis of the Fluid (which is the present case) it would certainly take a Position parallel to the Axis of its Fluid, if there was no other impediment.

The matter of fact being settled with the Cause of it, what the Causes of the change were is more Problematical. The Philosophers forecited gave their reason, *Aristarchus Samius* gives another, and a Comet by some is made the occasion of it. The Theorist thinks that the Dissolution of the Earth was the fundamental cause, and that the change came to pass at that time, as many indications and arguments shew. And as to the immediate cause or causes of it, I know none more probable than what the Theorist hath proposed : Either the change of its Center of Gravity, or of its Magnetism : The line of direction to those Magnetick particles and their passing through the Earth being so alter'd as to turn the Earth into another posture and hold it there. As to those expressions that he seems to quarrel with, of the Inclination of the Earth or the Pole towards the Sun, 'tis the expression of the Ancient Philosophers, though I think it might more properly be called an Obliquation. Then that the former state is called *status rectus*, is another expression which he finds fault with : 'tho every one sees that a *right situation* in such places is oppos'd to an *oblique* or inclined position to the Axis of the Sun or Ecliptick, and had been called *parallel* in several other places : and which he himself sometimes

Eng. Theor.
p. 134.

P. 71:

times, as well as other Authors*, calls a right Position. This is but trifling about words. If he grant that the Primitive Earth being uniform, and consequently equally pois'd, its Axis would be parallel (which for shortness, is sometimes call'd *right*) to the Axis of its Orbit, and is now in a different and oblique posture: This is all the Theorist desires as to matter of fact, I conceive the whole matter thus: When the Earth was in that even and parallel posture with the Axis of the Sun, it had a perpetual Equinox and unity of Seasons, the Equator and Ecliptick being coincident. And as to the Heavens, they with the fixt Stars mov'd or seem'd to move uniformly and concentrically with the Earth. But when the Earth chang'd its posture to that which it hath now, the Year became unequal, and the Equator and Ecliptick became distinct circles, or, if you will, a new circle arise from that distinction. The Earth in the mean time continuing its annual course in the Ecliptick, had the position of its Axis chang'd to a parallelism with the Axis of the Equator, which it holds throughout the whole Year. As to the Heavens, They seem'd to turn upon another Axis, or other Poles than they did before, and different from those of the Sun or the Earth. And this fundamental change in the Site of the Earth had a further chain of consequences, as is noted by the Theorist, in reference to the state both of the Animate and Inanimate World. This is in short, the state of the case, which is sometimes express'd in different terms, especially by the Ancients, who generally followed another System of the Heavens and the Earth, and were not always accurate in their expressions.

* *Perpetuū enim illis fruuntur Equinoctiis, quoniam axem motus diurni Jupiter rectum semper habet ad planum itineris sui circa Solem, nec ut Tellus obliquum. Hugen. Cosmoth. p. 105.*

This Author would square and conform all the Planets to the model of the present Earth. Whereas there is *diversity of administrations*, in the Natural World, as well as Spiritual, yet the same Providence every where. The Axes of the Planets are not all parallel to that of the Sun, nor all oblique: And those that are so, have not all the same degree of obliquity, yet we have reason to think them all habitable. In some there are no different Seasons of the Year, and in some they differ in another manner than ours: and the periods of their Years are very different. In like manner as to the Days, in some they are longer, in others shorter. In the *Moon* a day lasts fourteen or fifteen of our Days: and their Nights are proportionably longer than our Nights. In *Jupiter*, the Days are but of five hours, and so the Nights: that Planet being turned in ten hours about his Axis. In *Mercury* we know little what the Seasons or Days are, but its Year must be much shorter than ours: As also is that of *Venus*: And their heat from the Sun must be much greater. *Jupiter* and *Saturn* are at vast distances from the Sun, and must proportionably have less heat: And *Saturn* must have a greater difference of Summer and Winter than we have, by reason of his greater obliquity to the Sun. These and such like observations, shew, what vanity it is to make an universal standard from the state of our Earth. Or to say, This is best, and to make things otherwise would be inconsistent with the *infinite Wisdom of their Maker*, as this Examiner pretends to do.

P. 66.

Ibid.

To return to his Objections, This he suggests as one, that in case of a perpetual Equinox the annual motion of the Earth about the Sun would be to no purpose.

purpose. Of this we are no competent Judges, no more than of the other differences formention'd in the conditions of the Planets. Yet in that case, a distinction and computation of Time might be made by their aspect to the different Signs of the Zodiack: There may be (for any thing we know) in the extent of the Universe, Planets or great opaque Bodies that have no course about their Sun, for reasons best known to their Maker. And others that have no diurnal motion about their Axes. Nor ought such states, tho very different from ours be concluded incongruous. If this Objection of his were of any force, it would lie against *Jupiter* as well as against the Antediluvian Earth. And this minds me of his objection taken from *Saturn* and *Jupiter*, whose Axes, he says, are inclined to the Axis of the Ecliptick, and yet according to the Theorist they have suffer'd no Deluge. This is an unhappy Argument, for I think it hath two errors in it. But let us set down his words, that there may be no mistake or misrepresentation. *Another argument which may be brought to convince the Theorist that the Axis of the Earth was at first inclined to the Plane of the Ecliptick, is, that it is certain by observation, that Saturn and Jupiter (whom the Theorist will allow to have suffered no Deluge as yet) have their Axes not perpendicular but inclin'd to the Planes of their Orbits, and the position is true of all the other Planets, as far as they can be observ'd. And therefore, &c.* First, as to *Saturn*, I'm sure the Theorist never thought that Planet to be now in its original form; but to be broken, and to have already suffer'd a dissolution: as you may see in both Theories, *English* and *Latin*. Then as to the position of *Jupiter*, I know not whence he has this certain observation, that its Axis is oblique

P. 76.

Engl. p.
113, 114.
Lat. p. 107.

to

Cosmogr.
p. 105.

to the Plane of its Orbit. For *Hugenius* tells us just the contrary, and that it hath a perpetual Equinox. Let these things be examin'd, and hereafter let us be cautious how we take things upon the Examiner's word, if he be found to have committed two faults in one Objection.

Furthermore, He intimates (p. 94.) that the Theorist hath no mind to the notion of *Attraction*; I believe so too, nor in Philosophy to any other notion that is unconceivable. He must tell us how this *Attraction* differs from an *Occult Quality*: Whether it is a Mechanical Principle or no: And if not, from what Principle it arises. When he hath told us this, we shall be better able to judge of it.

After all, to conclude this Chapter, The one grand question with the Theorist, (whatsoever there may be with other Authors) is this, *Whether* the Earth has chang'd its situation since the beginning of the World: And that it has done so, the Theorist does still positively maintain.

Having insisted more largely upon these Four First Chapters, as being most Fundamental in the Controversie, we shall dispatch more readily this 5th and the 7th, leaving the 6th Chapter to a more particular disquisition in the last place.

This Fifth Chapter is designed against the Rivers of the Primitive Earth, according to that origin and derivation that is given them by the Theorist. But it is to be noted in the first place, That supposing they had any other origin or course than what is there assign'd, (excepting only an origin from Mountains) the
Theory

Theory continues still in force. For this point about the Waters of the First Earth and the explication of them, is one of those explications that admit of latitude and variety, and therefore as to the *Theory*, the question is only this, *Whether* an habitable Earth may have Rivers without Mountains. For if any Earth may have them without Mountains, why not the Primitive Earth? Now it will be hard for the Examiner, or any other to prove, That in every World where there are Waters and Rivers, there are Mountains also. We intimated before, that the general frame of an Earth might be such as would give a course to Waters without particular Mountains. But we will leave that at present to a further consideration, and observe now what his proofs are that there could be no Rivers in the Primitive Earth.

First he says, *According to the Theorist's own Hypothesis there could be no Rivers for a long time after the formation of the Earth.* Where is this said by the Theorist? His Hypothesis supposes that the soft and moist Earth could not but afford store of Vapours at first; as this Author in another place hath noted for the fence of the Theorist (p. 86.) and now he says the quite contrary. The Channells of the Rivers indeed would not be so deep and hollow at first as they are now, their cavities being wrought by degrees: but still there would not want Vapours to supply them. P. 87.

Then he says when that first moisture of the Earth was lessened, there could be no supply of Vapours from the Abyss: seeing the heat of the Sun could not reach so far, nor raise Vapours from it, or at least not in a sufficient quantity: As he pretends to prove hereafter. But in the mean time he speaks of great cracks or pits, whose dimensions and capacities he examines P. 88.

mines at pleasure, and by these he makes the Theorist to suppose the Vapours to ascend. Now I do not find that the Theorist makes any mention of these Pits, nor any use of those cracks for that purpose. The only question is, Whether the heat of the Sun in that Earth would reach so low as the Abyss, when the Earth was more dry'd, and its pores enlarg'd. So that this objection as he states it, seems to refer to some other Author.

P. 94, 95. But now supposing the Vapours rais'd, he considers what course they would take, or which way they would move in the open Air. But before that be examin'd, we must take notice how unfairly he deals with the Theorist, when he seems to make him suppose that Mountains *make way for the motion and dilatation of Vapours*. Which he never suppos'd, nor is it possible he should suppose it in the First Earth where there were no Mountains. Neither does the Theorist suppose, as this Author would insinuate, that Mountains or Cold dilate Vapours, but on the contrary, that they *stop and compress them*, as the words are cited even by the Examiner a little before, p. 86.

P. 97. Then as to the course of the Vapours when they are rais'd, The Theorist supposes that would be towards the Poles and the coldest Climates. But this Author says, They would all move Westward, or from East to West: *There being a continual wind blowing from the East to West, according to the motion of the Sun*. Whether that Wind come from the motion of the Sun, or of the Earth (which is contrary) is another question, but however let them move at first to the West, the question here is, *Where they would be condens'd*, or where they would fall. And there is little probability that their condensation would be under

under the Equator where they are most agitated, but rather by an impulse of new vapours they would soon divert towards the Poles: And losing their agitation there, would fall in Dews or Rains. Which condensation being made, and a passage open'd that way for new ones to supply their places, there would be a continual draught of Vapours from the hotter to the colder parts of the Earth.

We proceed now to the Seventh Chapter, which is in a good measure upon the same or a like subject with this, namely concerning the penetration of the heat of the Sun into the Body of the Earth. This, he says, cannot be to any considerable depth: nor could it pass the exterior Orb of the first Earth, and affect the Abyss or raise vapours from it. To prove this, he supposes that exterior Earth divided into so many surfaces as he pleases, then supposing the heat diminish'd in every surface, he concludes it could not possibly pass through so many. Thus you may divide an Inch into an hundred or a thousand surfaces, and prove from thence that no heat of the Sun could pierce through an Inch of Earth. We must rather consider Pores than Surfaces in this case, and whether those Pores were straight or oblique the motion would pass however, 'tho not the Light. And the heat of the Sun might have its effect, by a direct or indirect motion, to a great depth within the Earth, notwithstanding the multitude of Surfaces that he imagines. Those that think a Comet, upon its nearer approach to the Sun, would be pierc'd with its heat through and through; and to such a degree as to become much hotter than red hot Iron, will not think it strange that at our distance from the Sun its heat

P. 148.

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should

should have some proportionable effect upon the inward parts of the Earth. And all those imaginary solid Surfaces do not hinder, you see, the Magnetick particles from running through the Body of the Earth, and making the Globe one great Magnet.

But let those considerations have what effect they can, this supposition however is nothing peculiar to the Theorist. I know some learned men think the heat of the Sun does penetrate deep into the bowels of the Earth; Others think it does not, and either of them have their arguments. These alledge the equal temper of Vaults and Mines at different seasons of the year: The other say 'tis true, subterraneous places keep their equality of temper much better than the external Air, and those differences that appear to us are in a great measure by comparison with the temper of our Bodies. Then for their own opinion, they take an argument from the generation of Metals and Minerals in the bowels of the Earth, and other Subterraneous fossiles. These we see are ripen'd by degrees in several ages, and cannot, as they think, be brought to Maturity and rais'd into the exterior Earth, without the heat and influence of the Sun. Of the same Sun that actuates all the Vegetable World, that quickens Seeds, and raises Juices into the roots of our deepest and tops of our highest Oakes and Cedars.

But let this remain a Problem; I will instance in another remarkable Phenomenon which is most for the present purpose, I mean Earthquakes. Let us consider the Causes of them, and the Depths of them. I think all agree that Earthquakes arise from the rarefaction of Vapours and Exhalations, and that
this

this rarefaction must be made by some heat; and no other is yet prov'd to us by this Author than that of the Sun. Then as to the depth of Earthquakes, we find they are deeper than the bottom of the Sea. For, besides that they communicate with different Countries divided by the Sea, they are found sometimes to arise within the Sea and from the bottom of it, at great depths. This seems to prove that there may be a strong rarefaction of Vapours and Exhalations far within the bowels of the Earth: and the Theorist desires no more. If in the present constitution of the Earth there may be such Concussions and Subversions for a great extent, we have no reason to believe but there might be (at a time appointed by Providence) an Universal Disruption, as that Earth was constituted. Finally, Whatsoever the causes of this Disruption and Dissolution were, 'tis certain there was a *Disruption of the Abyss*, and that Disruption Universal as the Deluge was: which answers sufficiently the design of the *Theory*. However if he have a mind to see how this agrees with History, both Sacred and Prophane, he may consult, if he please, what the Theorist hath noted upon that argument, *Archæol. l. 2. c. 4.* besides other places.

But this Author says further, That supposing such a Disruption of the Abyss, and Dissolution of the Exterior Earth, no Universal Deluge however could follow upon it: because there could not be Water enough left in the Abyss to make or occasion such a Deluge: For the Rivers of the Earth being then supply'd from the Abyss, by such a time, or before the time of the Deluge, he says there would be no Water left in it. Thus he goes from one extream to another: Before he said the power of the Sun could not reach

or affect the Abyſs to draw out any Vapours from it, now he would make the Evaporation ſo exceſſive, that it would have emptied the great Abyſs before the Deluge. This is a great undertaking, and to make it good he takes a great compaſs. He pretends to ſhow us what quantity of Water all the Rivers of the Earth throw into the Sea every day; and beginning with the River *Po*, and taking his meaſure from that, he ſuppoſes there are ſuch a certain number of equivalent Rivers upon the face of the whole Earth; and if the *Po* caſts ſo much Water into the Sea, the reſt will caſt ſo much more, and in concluſion ſo much as would empty the Abyſs.

You will eaſily believe, *Sir*, there muſt be great uncertainties in this computation. But if that was certain, as it is far from it, ſtill he goes upon ſuppoſitions that are not allowed by the Theoriſt. For firſt, He ſuppoſes the waters of the preſent Sea to be equal to the Waters of the Great Abyſs: Whereas ſuppoſing them of the ſame depth, there would be near twice as much Water in the *Great Deep* as is now in the Ocean: ſeeing the Abyſs was extended under the whole Earth, and the Sea reaches but to half of it. Secondly, He ſhould prove that the Rivers of the Antediluvian Earth were as many and as great as we have now. The Torrid Zone then had none, and much leſs would ſerve the Temperate Climates than is requiſit now for the whole Earth. Beſides, The Rivers of that Earth were not ſupply'd by Vapours only from the Abyſs, but alſo from all the Earth, and all the Waters upon the Earth: And when the Rivers were partly loſt and ſpent in the Torrid Zone, they were in a great meaſure exhal'd there, and drawn into the Air by the heat of the Sun, and would fall again in ano-

another place to make new Rains and a new supply to the Rivers. So in like manner when he supposes the Rivers that were upon the Earth at the time of the disruption of the Great Deep, to have thrown themselves off the Land, as if they were lost: and makes a computation how much Waters all the Rivers of the Earth amount to, This, I say, is a needless computation as to the present purpose. For whatsoever mass of Waters they amounted to, it would not be lost, if they fell down and joyned with the Abyss they would increase its store, and be thrown up again by the fall of the fragments, making so much a greater mass to overflow the Earth. So that nothing is gain'd by this Supposition, the effect would be the same as to the Deluge. Whether the Waters above the Earth and those under the Earth met together sooner or later, when their forces were joyned they would still have the same effect: as we said before of the Vapours. And to conclude that point, The whole summ of Waters, or Vapours convertible into waters, that were from the beginning, or at any time, would still be preserv'd above ground or under ground: and that would turn to the same account as to the Flood.

These Waters and Vapours all collected, the Theorist supposes sufficient, upon a dissolution of the Earth, to make the Deluge. Not indeed in the nature of a standing Pool, as it is usually conceiv'd. A quiet Pool, I say, overtopping and standing calm over the heads of the highest Mountains, but, as a rushing Sea, overflowing and sweeping them with its raging Waves and impetuous fluctuations, when it was violently forc'd out of all its Channels, and the Vapours condens'd into Rain. Such an inundation as this, would be sufficient to destroy both Man and Beast and other Creatures: those few excepted that were

were miraculously preserv'd in the Ark. This is the Theorist's Explication of the Deluge, and I see nothing in this Argument that will destroy or weaken it.

Now this being the state of the Deluge according to the Theorist, what this Author says in the next Paragraph (*p. 167.*) is either a misrepresentation, or an equivocation. For the Eight Oceans requir'd by the Theorist, is the quantity of Water necessary for a Deluge in the way of a standing Pool: whereas this Author represents it as if the Theorist required so much Water to make a Deluge upon his Hypothesis. This, I suppose, upon reflection, the Author cannot but see to be a mistake, or a wilful misrepresentation.

This is the summ of his 7th Chapter: There are besides some suggestions made which it may be were intended for objections by the Author. As when he says (*p. 151.*) That the heat of the Sun would be intolerable upon the surface of the Earth, if it could pierce and operate upon the Abyss. We allow that its heat was intolerable in the Torrid Zone, which thereby became uninhabitable: and there only the Sun was in its full strength and had its greatest effect upon the Abyss. But in the other Climates, the heat would be moderate enough: nay so moderate, that this Author says in another place, it would not be sufficient to ripen fruits, and in the whole, of less force than it is now in the present constitution of the Earth. So apt is contention to carry one out of one extream into another.

His last Objection is about the duration of the Flood, That it could not last in its force 150 days, if it had been made by a dissolution of the Earth and an Eruption of the Abyss. But as this is affirm'd by him
without

without proof, so the contrary is sufficiently explain'd and made out both in the *Lat. and English Theory*, p. 56. p. 52.

I had forgot to tell him, That he ought not to suppose, as he seems to do, when he is emptying the Abyſs, (p. 165.) That after the Torrid Zone was soak'd with Waters by the issues of the Rivers, no more Waters or Vapours were drawn from it then, than were before, or consequently no less, from the Abyſs. For when the middle parts of the Earth had drunk in those Waters, the force of the Sun would be less upon the Abyſs thorough those parts, and the Vapours would be more and greater from them than before when they were dryer, and in the same proportion there needed less supplies from the Abyſs.

Chap. 6. Concerning the Figure of the Earth.

I deferr'd the consideration of This Chapter to the last, because I thought it of more general concern, and might deserve a fuller disquisition. 'Tis now, you know, become a common controverſie or enquiry, *What the Figure of the Earth is*. Many think it not truly Spherical, as it was imagin'd formerly, but a Spheroid, either oblong or oblate: that is, either extended in length toward the Poles, like an Oval: or, on the contrary, swelling in breadth under the Equator, and so shorter than a just Sphere betwixt Pole and Pole, and broader in the middle parts. 'Tis true the Theorist is not directly concern'd in this controverſie, because he does not in the *Theory* affirm the present

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sent Earth to be Oblong or Oval: not knowing what change might be made at its dissolution. However it may be worth the while to enquire what Arguments are brought, either from Causes or Effects, to determine the Figure of the Earth, whether past or present.

'Tis easie indeed by Observation to determine that the Earth is a Convex Body, not plain as the *Epicureans* fancied: and Convex on all sides, and therefore in some sort Orbicular; but whether it be truly Spherical, those common Observations will not determine. The Theorist nam'd and pointed at such Observations as he thought would be most likely to discover the precise Figure of the Earth: As to observe, for instance, Whether the extent of a Degree was the same all the Earth over, in different Latitudes or at different Distances from its Equator. Then to observe whether the shade of the Earth in a total Eclipse of the Moon be truly round, or any other ways irregular. And also to observe, if towards the Poles the return of the Sun into their Horizon be according to the rules of a Spherical surface of the Earth. Let us consider these separately as to the present Earth.

As to the measure of a Degree in different Latitudes, we find that Authors are not all of the same mind. Some will have them unequal, and in such a manner, according to their Distance from the Equator, as from that to infer, that the Earth is Oblong. This Examiner takes notice of Dr. *Eisensmidius*, as one that hath made that observation, and that inference from it, and gives him very rude words upon that occasion, making him a man of *prodigious stupidity and carelessness*: and one that did not understand the first six Elements

ments of Euclid, or indeed those of common sense. Whatsoever this Professor was, he was not the first that made that observation and inference. For another Mathematician, better known, had made the same, some time before him: I mean *Milliet Deschales*, in his *General Principles of Geography*, Fr. I. 1. *propof.* 29. But 'tis true, he says, this conjecture of his, That the Figure of the Earth is Oval or Elliptick; would not be well grounded if the shade of the Earth in Lunar Eclipses was found to be always perfectly round; of which we shall have occasion to speak hereafter. For this which he makes a scruple against his own opinion is by others made an occasion of suspecting that the Earth is really Oval. But we must also acknowledge that the same *Deschales* in his *Latin* works does not own the observation, but owns the inference, which is that the Examiner quarrels with. He owns it, I say, in these words, *Si figura terræ esset Ovalis, plura milliaria decurrenda essent versus Aequinoctialem ad in-* *Geogr. l. 1. prop. 4.*
veniendam in elevatione poli mutationem unius gradus quam versus polos. And he gives this reason, *Quia Ovalis figura prope Vertices minorem sphaeram imitatur: versus Aequinoctialem autem in majorem sphaeram degenerat.* And again, having taken notice of the various computations of a degree upon the Earth, he subjoyns, *Hæc observationum discrepantia nonnullis suspicionem fecit, Tellurem non omnino sphaericam esse, sed spheroidem Ellipticam, ita ut versus polos in minorem circulum abiret. Sed opus est pluribus observationibus ad id persuadendum.* *Ibid. p. 36.*
 The Theorist did not assert either the Observation to be true or the Inference, but mark'd it as an Observation that deserv'd to be enquir'd into, in order to determine the Figure of the Earth. For it seems apparent, That if the Body of the Earth be Oblong or

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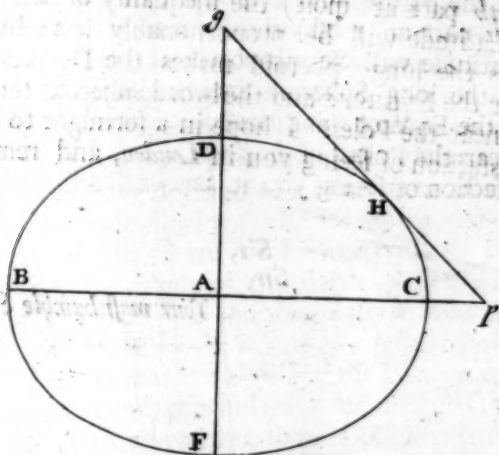
Oblate,

Oblate, the extent of a Degree will not be really the same as if it was truly Spherical. Neither do I know any single Observation that would give us more light or better help us to discover what the configuration of the Earth is, than the measure of a Degree exactly taken in different Latitudes.

I hapned lately to be in company with a Learned Gentleman, and amongst other things that fell into discourse, I ask'd his opinion, What inequality there would be in the Degrees of the Earth, in case it was Oval, and where it would fall: Whether they would be greater towards the Poles, or towards the Equator. We were suddenly interrupted by the coming in of new Company, but he said he would send me his Thoughts upon a little reflection; and accordingly, after a few days he was pleased to send me this Letter.

SIR,

HAVING now some leisure (the Elections for Parliament, wherein I had any concern, being over) I have here sent you my Thoughts on a Subject we lately discours'd of at *Kings-ton*. Whether in case the Earth is a long Spheroid, the Degrees of Latitude would be greater near the Equator, or near the Poles. I conceive they would be greater near the Equator. Let the Eclipsis *BDCE* represent the Earth, draw the Line *gp*, which may be a Tangent to the Eclipsis, and likewise (meeting with the Axis *BC* and its transverse *FD* after they are produc'd) make the Triangle *gAp* an Isocles, and consequently the Angles
at



at the base *Agp*. *Agp* each 45 Degrees. I say *HC* will measure the 45. Degrees of Latitude near the Pole, and *DH* (which by inspection without farther demonstration is evidently bigger) those near the Equator. (I ought to have premis'd that *B* and *C* represent the Poles) It is plain the Inhabitants at *H* will be in the Latitude of 45 degrees, by reason their Horizontal Plane *gp* is by construction 45 Degrees distant from the Horizon of the Inhabitants under the Line at *D* which lies parallel to the Axis *BC*.

If the Earth be a broad Spheroid, *D* and *F* representing the Poles, then by the same method of reasoning the Degrees of Latitude will be greatest near the Poles. But as the longest and shortest Diameter

of the Earth has in no wise so great a disproportion as in the Figure (their difference not exceeding the 200th part at most) the inequality of the Degrees of Latitude will be proportionably less; but in all cases the long Spheroid makes the Degrees greatest near the Equator: and the broad Spheroid those greatest near the Poles. I hope in a fortnight to have the satisfaction of seeing you in London, and remain

Sir,

Your most humble Servant.

The Examiner would do well to consider this, least all the reproachful characters he casts upon *Eisenfmidius*, should recoil upon himself. 'Tis Prudence, as well as Good Manners not to be fierce and vehement in Censures, for fear of a mistake, and a backblow. However, the pretended demonstration which this Examiner brings to prove, That, in case the Earth was Oblong the Degrees would be greater toward the Poles, does not affect *Eisenfmidius*, for it proceeds upon a supposition which that Author does not allow: namely, That the Vertical Lines, or the Lines of Gravity are to be drawn directly to the Center of the Earth: whereas *Eisenfmidius* supposes they ought to be drawn at right Angles to the Tangent of each respective Horizon, and would not in all Figures lead directly

directly to the Center. However we do not wonder that he is so rude to strangers, seeing he bears so hard, in other places, upon some of our own learned Country-men.

We proceed now to the Theorist's Second Observation, about Lunar Eclipses and the Shade of the Earth. This Shade is generally presumed to be exactly round, as the Section of a Cone: And yet the best Astronomers have doubted of it, and some upon that occasion have doubted of the Figure of the Earth.

Kepler in an Observation of a Lunar Total Eclipse, not finding the Shade of the Earth perfectly round, but rather Oblong, *ut ejus dimetiens à Zonâ Torridâ* *Ephemer. par. 2. ad An. 1624.*
confurgentis sit minor dimetiente ejus à Polis Terra surgentis, suspects that the Figure of the Earth was so too.

And that we must conclude it to be so from this Observation, if there was not some Obliquity in the rays of the Sun, whereof he shews no cause or occasion.

Si retinenda esset, inquit, *rectitudo radiorum, Globus ipse Terra fiet Oviformis, diametro per Polos longiore.* And a-like Observation to this he cites from *Tycho Brabé*; in a central, or next to central Eclipse of the Moon. These two great Astronomers, it seems, did not find the Shade of the Earth to be justly Conical. And thereby take away the reason or lessen the doubt which hindred *M. Deschales* from concluding (upon another Observation) the Figure of the Earth to be Oval.

The Third Observation of the Theorist's remains, which is about the return of the Sun unto the Polar parts of the Earth, whether that be according to the rules of a Spherical Surface. The Observations that have been made hitherto in the Northern Climates about

about the return of the Sun to them, make it quicker than will easily consist with a Spherical Figure of the Earth: much less are they favourable to a Gibbous Form. For that gibbosity under the Equator must needs hinder the appearance and discovery of the Sun in the respective Polar parts more than a Spherical Figure would do. Now it hath been observ'd in *Nova Zembla*, That the returning Sun appear'd to them 17. days sooner than they expected according to the rules of Astronomy, the Earth being supposed truly Spherical: and this may be thought an Argument that the Earth is rather deprest in its middle parts. I leave the matter to further examination. I know 'tis usually imputed to Refractions, but that is upon the presumption that the Earth is justly Spherical: and a better answer (upon that supposition) I think cannot be found. Tho, I think, it will not be easie in that way, and upon that solution to make all the Phenomena agree, or to shew that the Refractions could make so great a difference. However this is no improper Topick to be consider'd in reference to the determination of the Figure of the Earth, and for that purpose it was noted by the Theorist.

We have now done with that side of the Question that respects the Oblong Figure of the Earth, and it remains to consider the other part: I mean the opinion of those that make the Earth protuberant about the Equator, or an oblate Spheroid. This the Learned Monsieur *Hugens* thinks may be prov'd by experiments made about the different Vibrations of *Pendulums* in different Latitudes of the Earth. 'Tis found, he says, by experience that a *Pendulum* near the Equator makes its Vibrations slower than another of the same length further

*Disc. de la
Pesant. p.
245, &c.*

further from the Equator. And gives an instance of it from an experiment made at *Caiene* in *America* (which is 4 or 5 degrees from the Equator) compar'd with another made at *Paris*. From this Tryal he concludes, first, that the gravitation is less under and near the Equator than towards the Poles, according to their several degrees of Latitude. Then he infers by consequence, that the Land and the Sea are higher towards the Equator than towards the Poles. And in conclusion, That the figure of the Earth is Protuberant and Gibbous in the Middle, and more flatt'd or of a shorter Diameter betwixt Pole and Pole.

In this conclusion you see there are several things to be considered according to the Premises. First matter of Fact, concerning the inequality of Vibrations in equal Pendulums according to their different Latitudes: then the following inferences made from that inequality. As to matter of fact, Monsieur *Hugens* seems to be doubtful himself. He does not vouch it from his own experience, but he takes it from the report of Monsieur *Richer*: whose Person or Character I do not know, nor whether his relation be Extant in Print. However Monsieur *Hugens* speaks dubiously of the experiment, as such an one whereof we ought to expect further Confirmation. For he says, we cannot ^{*Ibid* p. 149.} Trust entirely to this first observation, whereof we have not any circumstance noted to us: and still less to those that are said to be made at Guadaloupe, (at a greater Latitude) where the Pendule is said to be shorter by two lines than that at *Paris*. We must expect to be more justly inform'd of these different lengths of Pendules, as well under the Line as in other Climates. And he refers ^{*Ibid* p. 166.}

us to a further trial by his Clocks rectified for a second voyage, whereof I have yet heard no report. If matter of Fact be dubious, or experiments discordant, we cannot be assured of the Conclusion. It were to be wish'd, That this different gravitation in different Latitudes might be prov'd by other experiments than that of the Pendulum. Methinks in ponderous Bodies this difference might become Sensible: Not indeed by a Balance or Scales, for the supposed decrease of Gravity would have the same effect upon the Counterpoise as upon the Body weighed, but by other Powers that do not depend immediately upon Gravity, as *Springs* or any other Engines, or by rarefactions, or whatsoever hath the force to raise, sustain, or remove ponderous Bodies. For such Powers must have a less effect with us than near the Equator, where the gravitation of Bodies that make the counterpoise, is supposed to be much lessen'd. Neither do I know if they have try'd the Barometer, whether that will discover any such elevation at or near the Equator: the Mercury sinking there much lower than with us, or indeed to nothing, if the height be comparatively so great as is suppos'd. It seems strange that the difference of 17 Miles (call it little, or call it great, compar'd with the semidiameter of the Earth) should have a sensible effect upon Pendulums and upon nothing else.

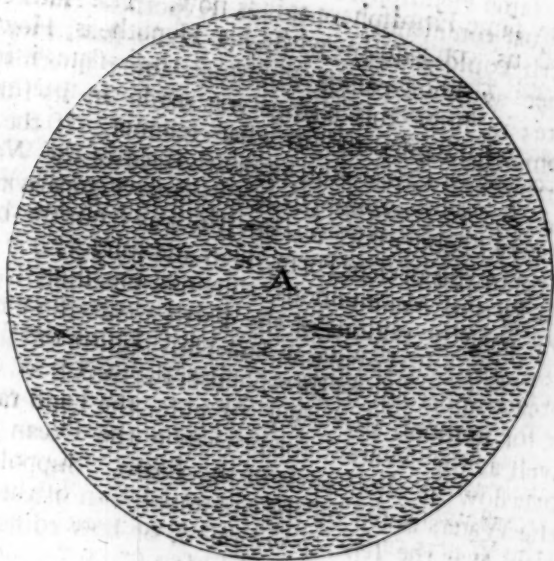
Methinks, that height of the Equator should make a different Horizon (as to the Heavens, or the Earth and Sea) East and West, from North and South; The figure of the Earth being a Sphere one way and a Spheroid in the other. The Sea also must be of a prodigious depth at the Equator, deeper by Seventeen Miles than at or near the Poles. I would glad-

ly know what experience there is of this. Then in reference to our *Rivers*, How swift and rapid, upon this Hypothesis, must the *Rivers* be that rise at or near the Equator, or how slow the motion of those that ascend towards it, if at all they can be supposed to clime so great an Hill. The great River of the *Amazons*, in Southern *America*, is in some parts of it four or five degrees from the Equator, others say much more, Yet runs up to the Equator with that vast load of water, and throws it self there into the Ocean. In the Northern *America*, *Rio Negro* is represented to us as having a longer course against the bent of the Earth, and crossing the Equator, falls down Southward several Degrees. So the *Nile* in *Africa* crosses the Line and hath a long course on this side of it. *Rivers* do not rise higher by a natural course than their Fountain's head, and Hydrographers usually assign two foot or two foot and an half in a Mile for the descent of *Rivers*, but upon this Hypothesis there will be fourteen or fifteen foot (in respect of the center of the Earth) for every Mile, in Rivers descending from the Equator; which is a Precipitation rather than a Navigable Stream. Suppose a Canal cut from the Equator to the Pole, t'would be a paradox to say the water would not flow in this Chanel, nor descend towards the Pole having Fourteen or Fifteen foot descent for every Mile, according to your figure of the Earth. And also it would be as great or a greater Paradox to suppose that Rivers would rise to the Equator, and with the same celerity (as we see they do) upon an ascent of so many feet. And after all, to conclude the argument; If this difference of Pendulums be found, it will still bear a dispute from what Physical

sical Causes that difference Proceeds.

Thus far we have considered what arguments have been brought for the oblate figure of the Earth, from Effects: and have noted such observations to be made as we thought might be useful for discovery of Truth, on what side soever it may fall. We are now to consider an argument taken from the Causes, and brought by these Authors to prove the same spheroidical figure of the Globe. To this purpose they observe, as is obvious and reasonable, that in the diurnal motion of the Earth the middle parts about the Equator (where the circles are greatest, and consequently the motion swiftest) would fly off with a greater force, and so rise higher than the other parts that were mov'd in lesser circles in the same time, and would have less force to remove themselves from the center of their Motion. This is agreed on all hands, and was own'd by the Theorist in a fluid Globe turn'd about it's Axis, in case there was no impediment to hinder the rising or recession of those middle parts. But before we speak to that, on both sides you see it must be suppos'd and granted That the Globe of the Earth was once Fluid, or the exterior Orb of it: and we ought to consider when, or at what time that was. It must have been surely at the first formation of the Earth when it rise from a Chaos, and before its parts were Consolidated and grown Hard. Supposing then that the interior Orb of the Earth was once cover'd over with an Orb of water, The question will be, How this Orb of water came to be cover'd with dry Land, or came to be divided into Land and Water, as it is Now.

Let (A) represent an Hemisphere of the Earth, in its first state, when covered with Water: And (B) the
the



the same Hemisphere as it is now. This Author must tell us, consistently with his Hypothesis, How the Earth could pass out of one of these states into the other without passing thorough some intermediate state; or how this change was made in its surface, from what causes and in what manner. If the First Earth was a Concretion upon the face of the Waters, then indeed it would have the same Figure with the watery Globe under it; but if it was from the beginning in this present Form, firm and solid as it is now, Rocky and Mountainous, then the Question is, *How* the parts or regions of the Earth about the Equator could be rais'd above a Spherical Figure, or into an oblate Spheroid, as they say the Earth is now. I take it for granted, that they suppose the Land rais'd as well as the Water: for otherwise the Ocean would overflow at those parts of the Earth. Suppose then the Waters rais'd by the circumvolution of the Earth, how was the *Terra firma* rais'd, or how could it be rais'd by that or any such cause?

These Questions are no matter of difficulty to the Theorist, who supposes the First Earth to have covered the Waters, and to have taken their shape, whatsoever it was, as upon a mould. Then upon its Dissolution and Disruption at the Deluge, to have fallen into that uneven and interrupted Form it hath now. But seeing this method does not please the Examiner, He must tell us how, upon his Hypothesis, the Land or solid parts of the Earth could be rais'd above a Spherical Convexity into such a gibbous Figure as he supposes them now to have under the Equator.

Monfieur *Hugens* * makes this broad Spheroid of

* *M. Hugens* de la

pesant, p. 152. Il est a croire, que la Terre a pris cette figure, lors qu'elle a esté assemblée par l'effet de la pesanteur: sa matiere aiant dès lors le mouvement circulaire de 24 heures.

the

the Earth to have been the effect of Gravity in the formation of the Earth: the matter whereof being then turned round, it would, as he thinks, be brought to settle in this Oblate Figure. Very well! but this must be in its very first Concretion from a Chaos, before it was fixt and compact as it is now; For the rotation of the Earth could have no such effect upon it after it was hard. Now if you admit the exteriour Globe of the Earth, to have been in such a state betwixt fixtness and fluidity, it will lead us directly to the Theorist's Hypothesis, which supposes a soft and tender Concretion at first over all the face of the Waters. I say, *over all the face of the Waters*, for it must be Universal, both because there is no reason why these earthy Particles that made the Concretion should not fall upon one part of the Globe as well as upon another; and also if they did not fall upon the Equinoctial parts, how came there to be Land in that part, or that Land rais'd higher than the rest, as this Hypothesis will have it.

In these remarks upon the protuberant Figure of the Earth; you see it is allow'd, that there would be a greater tendency from the Center in the middle parts of the Globe, and the Waters would rise there, if there was no impediment. But the Theorist did believe that the Vortex, or circumfluent Orb was streighter, or of a shorter diameter there than thorough the Poles: and consequently the Waters having less room to dilate, would be press'd and detrudd towards the Poles. These Authors, it may be, will allow no Vortices to the Planets, but then they must assign some other sufficient cause to carry the Planets in their periodical motions (and with the same velocity for innumerable ages) about their common Center, and the secondary about their primary. As also
what

what gives them their diurnal rotation, and the different position of their Axes. Neither would it be easie to conceive how a great mass of fluid and volatile matter, having no current, or determination any one way, and being often checkt in its progressive motion, should not fall into circular motions, or into Vortices of one sort or other. Especially if you place in this mass some great solid Bodies turned about their Axes.

These are more general Problems, and when they are determin'd with certainty, we shall better judge of the particulars that depend upon them. But I say still, that neither Figure of the Earth, Oblong or Oblate, can be prov'd from the rotation of the Earth and its gravity, without supposing the Globe form'd into that shape before it came to be hardned, before it came to be loaded and stiffned by Rocks and stony Mountains. Therefore upon both Hypotheses it must be allow'd that there was such a time, such a state of the Earth, when its tender Orb was capable of those impressions and modifications; and that Orb must have lain above the Waters, not under them, nor radicated to the bottom of them, for then such Causes could not have had such an effect upon it. And in the last place, This Concretion upon the Waters must have been throughout all the parts of the Earth, or all the parts of the Land which are now rais'd above a Spherical Surface: and no reason can be given, as we noted before, why the rest should not be cover'd as well as those. So that in effect both the Hypotheses suppose that all the watery Globe was at first cover'd with an earthy Concretion.

Now this being admitted, you have confirm'd the main point of the *Theory*: namely, That the Abyss was once, or at first cover'd with a terrestrial Concretion, or an Orb of Earth. Grant this and we'll compound
for

For the rest, let the Earth at present be of what Figure it will. If there was such an original Earth that cover'd the Waters, both the form and equilibration of that Earth may easily appear, and how by a dissolution of it a Deluge might arise. But as to the present Earth, the Theorist never affirm'd that its Figure was Oval, but he noted such observations made or to be made, as he thought might be proper to determine its Figure: and still desires that they may be pursued. He added also that he would be glad to receive any new ones, that would demonstrate the precise Figure of the Earth. And accordingly he is willing to consider in this particular and all others, the Arguments and Remarks of such Eminent Authors, as have lately given a new light to the System of the World.

*Lat. Theor.
lib. 2. p.
185.*

This may suffice to have spoken in general concerning these two spheroidical Figures of the Earth. We must now consider what particular objections are made by the Examiner against its Oval Figure. He says, admitting the Oval Figure of that first Earth, it would not be capable however to give a course to the Rivers from the Polar Parts towards the Equinoctial. And his reason is this, because the same Causes which cast the Abyss or the Ocean towards the Poles, would also keep the Rivers from descending from the Poles. But there is no parity of reason betwixt the Abyss or the Ocean and the Rivers. We see in the flux and reflux of the Ocean, let the Cause of it be what it will, it hath not that effect upon Rivers, nor upon Lakes, nor upon lesser Seas: Yet the circumrotation of the Earth continues the same. And his confounding the Ocean and Rivers in the Antediluvian Earth is so much the worse, seeing

*p. 103,
104, &c.*

ing there never was an Ocean and Rivers together in that Earth, While there was an open Ocean there were no Rivers, and when there were Rivers there was no open Ocean, but an inclos'd Abyfs. So tho' he makes large Transcripts there and elsewhere out of the Theory, he does not seem always to have well digested the method of it.

P. 107. After this objection, th' Examiner charges the Theorist with want of Skill in Logick: but his charge is grounded upon another Misunderstanding or Misrepresentation. He pretends there, that the Theorist hath made such a Ratiocination as this. *All Bodies by reason of the Earths Diurnal Rotation do endeavour to recede from the Axis of their Motion: but by reason of the Pressure of the Air and the Streightness of the Orb they cannot recede from the Axis of their Motion; therefore they will move towards the Poles where they will come nearer to the Axis of their Motion.* These are the Examiner's Words in that place, where he says he will put the Theorist's reasoning in other Words; But I do not like that Method, unless th' Examiner were a more judicious or faithful Paraphrast than he seems to be; let every one be Tryed by their own Words, and if there be any false Logick or nonsense in the forecited words of th' Examiner, let it fall upon their Author. The Theorist said, that Bodies by reason of the Earths Motion did *conari a centro sui motus recedere*: These words this Translator renders *endeavour to recede from the Axis of their motion*: and by changing the word *Center* into *Axis*, (whether carelessly or wilfully I know not) of plain sence he hath made non-sence: and then makes this Conclusion, (which follows indeed from his own words, but not from those of the Theorist) *Because all Bodies*

Theor. lib.
2. c. 5.
p. 186.

p. 108.

do

do endeavour to recede from the Axis of their motion, therefore they will endeavour to go to the Axis of their motion.

The Theorist's argumentation was plainly this, Seeing in the rotation of the Earth Bodies tend from the Center of their motion, if they meet with an impediment there; they will move laterally in the next, easiest and openest way: and therefore the Waters under the Equator being stop'd in their first tendency, would divert towards the Poles. Wherein, I think, there is no false Logick. That there was no impediment there, he must prove by other Arguments than his own dictates or bare assertion, which will not pass for a proof.

He proceeds now to discourse of the Centrifugal force and the effects of it, together with gravity. But he should have given us a better notion of the Centrifugal force than what he sets down there; for he says, (p. 110. l. 24.) *A Centrifugal force, is that force by which a Body is drawn towards the Center.* This is a strange signification of that word. And in the next page (l. 22.) he says, by this Centrifugal force Bodies *endeavour to recede from the Center of their motion*, which is true, but contrary to what he said just before. I think 'tis Gravity not Centrifugal force, that brings Bodies towards the Center.

P. 111.

But to pass by this contradiction, and to proceed: What he says, from other Authors, about the proportions of the Centrifugal force and Gravity in Bodies turn'd round, and particularly in Fluids, how they would fly off more or less according to the Circles of their motion, was always (as hath been mention'd before) suppos'd and allow'd by the Theorist, if there was no restraint or pressure upon one part more than

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another

another of the fluid Globe. So that he might have spared here six or seven pages.

In like manner, he might have spar'd what he hath transcrib'd in his following Pages from those excellent Authors we referr'd to before, about calculating the diminutions of Gravity made by the Centrifugal force, in different Latitudes: with other such excursions. These, I say, might have been spar'd, as needless upon this occasion, or to the confutation of the *Theory*, till the principal point, upon which they depend, be better prov'd. I made bold to say, they were transcrib'd from those Authors, as any one may see that please to consult the Originals *Newt. Philos. Nat. princ. math. l. 3. prop. 18, 19, 20. Hugen's Discours. de la cause de la Pesanteur, p. 147, 148, &c.* And this French Discourse of Monsieur *Hugen's*, he hath not so much as once nam'd, tho he hath taken so much from it. And after all, when these things are determin'd in Speculation, it will still be a question what the True Physical Causes of them are.

P. 137,
138.

At last, for a further confirmation of the broad Spheroidical Figure of the Earth, he adds an Observation from the Planet *Jupiter*, which is found to be of such a Figure. And therefore, he says, *We need not doubt* but that the Earth, *which is a Planet like the rest, and turns round its Axis, as they do, is of the same Figure.* He might as well conclude that every Planet, as well as the Earth, is of the same Figure. And what reason can he give, why all the Planets that have a Rotation upon their Axis, are not broad Spheroids as well as those two which he supposes to be so? If that be a sufficient Cause and be found in other Planets as well as those, why hath it not the same effect? Or he might as well conclude, That the Earth hath a perpetual

petual Equinox because *Jupiter* hath so. This is the same fault which he hath so often committed, of measuring all the Works of God by one or two. If a Man was transported into the Moon, the nearest Planet: or into *Mercury* that is so near the Sun, or into *Saturn*, (or any of his *Satellites*) that is so remote from it: would he not find, think you, a much different face and state of those Planets, from what we have upon this Earth? Inhabitants of a different constitution, the furniture of every World different, Animals, Plants, Waters, and other Inanimate Things. As also different vicissitudes of Days and Nights, and the Seasons of the Year; according to their different Positions, Revolutions and Forms. Therefore not without reason we noted before, how much the narrowness of some Mens Spirits, Thoughts and Observations, confine them to a particular Pattern and Model, not considering the infinite variety of the Divine Works, whereof we are not competent Judges.

Now comes in his rude censure of Dr. *Eisenfmidius*, both for his Mathematicks and bad Logick, or want of common Sense; But to this we have spoken before. He also in the same Paragraph wonders at the Theorist's strange Logick, to make the Centrifugal force of Bodies upon the Earth to be the cause of its Oblong Figure. That indeed would be strange Logick if it was made the proximate cause of it. But that is not the Theorist's Logick but the Examiner's, as it is distorted and misrepresented by him. The Theorist suppos'd the pressure of that tumour of the Waters occasion'd by the Centrifugal force (as its original Cause) to be the immediate Cause of the Oblong Figure of the Earth; and that pressure suppos'd there is nothing illogical in the inference. He had formerly taken

P. 141.

P. 102,
103. notice of this reason from the straightness of the Orb in that part, when he gave the Theorist's account of that Figure, but he thought fit to forget it now, that his charge might not appear lame.

P. 31. This, Sir, is a short account of this Author's Objections; But there are some things so often repeated by him, that we are forc'd to take notice of them more than once: As that about Miracles and Final Causes. He truly notes that to be *a much easier and shorter way of giving an account of the Deluge*, or other Revolutions of Nature: But the question is not, which is the shortest and easiest way, but which is the truest. No Man in his senses can question the Divine Omnipotency, God could do these things purely miraculously, if he pleas'd, but the thing to be consider'd is, Whether, according to the methods of Providence in the Changes and Revolutions of the Natural World, the Course of Nature and of Natural Causes is not made use of so far as they will go. Both *Moses* and *S. Peter* mention Material Causes, but always including the Divine Word and Superintendency. The Theorist does not think (as is sufficiently testified in several places) that purely Material and Mechanical Causes, guided only by the Laws of Motion, could form this Earth, and the furniture of it: and does readily believe all Miracles recorded in Holy Writ, or elsewhere well grounded. But Miracles of our own making or imagining, want Authority to support them. Some Men when they are at a loss in the progress of their work, call in a Miracle to relieve them in their distress. You know what hath been noted both by Philosophers
Plat. Cratyl. and others to that purpose.

m. p. 425.

Ἐπεὶ δὲ πᾶσι τοῖς ἀνθρώποις, οἱ τὰς μηχανὰς κατασκευάζοντες, διὰς αἰετῶτος. Cum rei alicuius angustia

angustis harenis, ad machinas confugium & Deo inducunt. This is also remark'd and render'd in other words by Tully *de nat. Deor. l. 1.* *Cum explicare argumenti exitum non potestis, confugitis ad Deum.* S. Austin also speaking about the Supercelestial Waters, hath noted this method and reprov'd it, in these words, *Nec quisquam istos ipsa debet refellere ut dicat secundum omnipotentiam Dei cui causa sunt possibilia, oportere nunc cadere aquas etiam tam graves quam novimus atque sentimus, caelesti corpori in quos sunt fidei superfluas:* *Nunc enim quemadmodum Deus instituit naturas rerum secundum Scripturam ejus nos quare convenit, non autem quod ipse in iis vel ex iis ad miraculum omnipotentia sua velit operari, l. 2. Gen. ad lit.* You see discretion and moderation is to be used in these and such like matters.

As to Final Causes, the Contemplation of them is very useful to moral purposes, and of great satisfaction to the Mind where we can attain to them. But we must not pretend to prove a thing to be so or so in Nature, because we fancy it would be better so. Nor deny it to be in such a manner, because to our mind it would be better otherwise. Almighty Power and Wisdom that have the whole complex and composition of the Universe in View, take other measures than we can comprehend or account for. Even in this small Earth that we inhabit, there are several Plants and Animals which to us appear useless or noxious, and yet no doubt would be found proper for this state, if we had the whole prospect and Scheme of Providence. As to Efficient Causes, they must be either Material or Immaterial: and whatsoever is prov'd to be the Immediate Effect of an Immaterial Cause is so much the more acceptable to the Theorist as it argues a Power above Matter. But as to purely Material Causes, they must be Mechanical: There being no other Modes, or Powers of Matter (at least in the opinion of the Theorist) but what are Mechanical. And to explain Effects by such Causes is properly Natural Science.

We have taken notice before of this Author's ambiguous use of words without declaring in what sense
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he uses them. And he is no less ambiguous as to his opinions. When he speaks of the Origin and Formation of the WORLD, he does not tell us what he means by that word: whether the great Compound of the Universe, or that small part only where we reside. His *Centrifugal* force he interprets in contrary senses, or in contrary words, and reserves the sense to himself. Sometimes he speaks of the motion of the Sun, and sometimes of the motion of the Earth, and sticks to no System. Neither does he tell us what he means by the Mosaical Abyss, or *Tehom Rabbah*, which the Theorist supposes to have been broken up at the Deluge. We ought to know in what sense and signification he uses Words or Phrases: at least if he use them in a different sense from that of the Theorist's.

I know, Sir, you will also take notice of his hard Words and coarse Language, as, *That's false, that's absurd, that's ridiculous*. This you will say, is not usual Language amongst Gentlemen. But we find it too usual with some Writers, according to their particular temper and experience in the World. For my part, I think rudeness or disingenuity in examining the Writings of another Person, fall more heavy (in the construction of fair Readers) upon him that uses them, than upon him that suffers them. I am,

Sir,

Your most humble Servant,

F I N I S